EG2131 Chip User Manual

High-power MOS transistor, IGBT transistor gate driver chip

Version change log

Version number	date	description
V1.0	June 12, 2017	First draft of the EG2131 data sheet

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EG2131 chip data sheet V1.0

1. Features

ÿ High-end suspension bootstrap power supply design, withstanding voltage up to 300V

ÿ Adapt to 5V, 3.3V input voltage

ÿ The highest frequency supports 500KHZ

ÿ Low-side VCC under-voltage shutdown output

ÿ Output current capability IO+/- 1A/1.5A

ÿ Built-in dead zone control circuit

ÿ Built-in blocking function, completely prevent the output of the upper and lower tubes from being turned on at the same time

ÿ HIN input channel is active high and controls high-end HO output

ÿ LIN input channel is active low and controls low-side LO output

ÿ Fewer peripheral devices

ÿ Quiescent current is less than 5uA, very suitable for battery occasions

ÿ Package form: SOP-8

2. Description

EG2131 is a cost-effective high-power MOS transistor, IGBT transistor gate drive dedicated chip, which integrates logic signal input processing circuit.

circuit, dead-time control circuit, under-voltage shutdown circuit, blocking circuit, level shift circuit, pulse filter circuit and output drive circuit, dedicated to

Drive circuits in brushless motor controllers.

The high-end working voltage of EG2131 can reach 300V, the low-end Vcc power supply voltage range is 11V-20V, and the static power consumption is less than 5uA. the chip

It has a blocking function to prevent the output power tubes from being turned on at the same time. The input channel HIN has a built-in 200K pull-down resistor, and LIN has a built-in pull-up 5V.

High potential, when the input is floating, the upper and lower power MOS tubes are turned off, the output current capability is IO+/- 1/1.5A, and the SOP8 package is used.

3. Application areas

ÿ Mobile power high voltage fast charging switching power supply ÿ Variable frequency water pump controller ÿ 300V step-down switching power supply

ÿ Electric vehicle controller ÿ Brushless motor driver ÿ High voltage Class-D power amplifier

4. Pins

4.1 Pin Definition

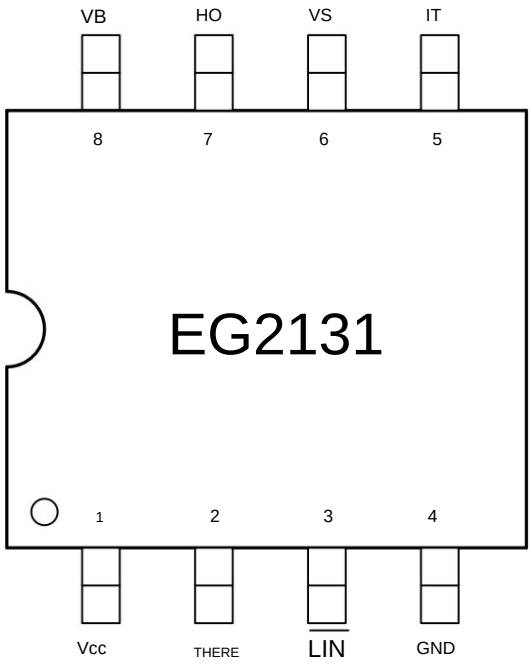


Figure 4-1. EG2131 Pin Definition

4.2 Pin description

Pin No.	Pin Name	I/O	describe
1	Vcc	Power	Chip working power input, voltage range 11V-20V, an external high frequency 0.1uF bypass Capacitors reduce high frequency noise at the chip input
2	THERE		The logic input control signal is active high and controls the turn-on and turn-off of the high-end power MOS transistor "0" is to turn off the power MOS tube "1" is to turn on the power MOS tube
3	LIN		The logic input control signal is active at low level, and controls the turn-on and turn-off of the low-side power MOS transistor "1" is to turn off the power MOS tube "0" is to turn on the power MOS tube
4	GND	GND	The ground terminal of the chip.
5	IT	O	output controls the turn-on and turn-off of the low-side MOS power transistor
6	VS	O	High-end floating end
7	HO	O	output controls the turn-on and turn-off of the high-end MOS power transistor
8	VB	Power	High-end floating power supply

5. Structure block diagram

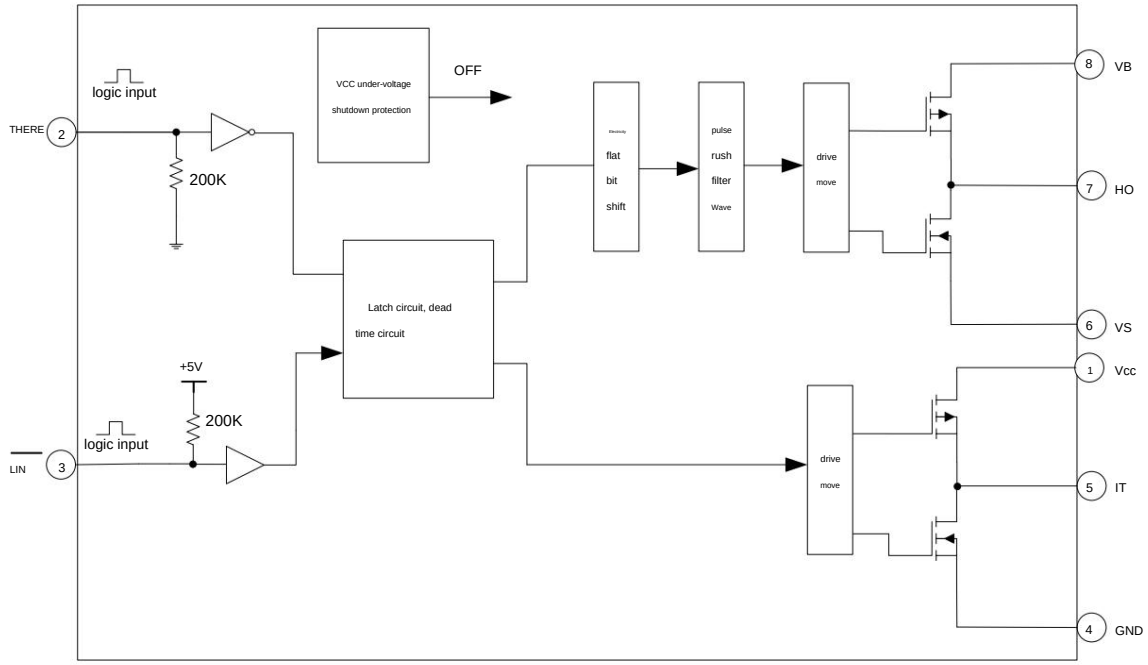


Figure 5-1. EG2131 Internal Circuit Diagram

6. Typical application circuit

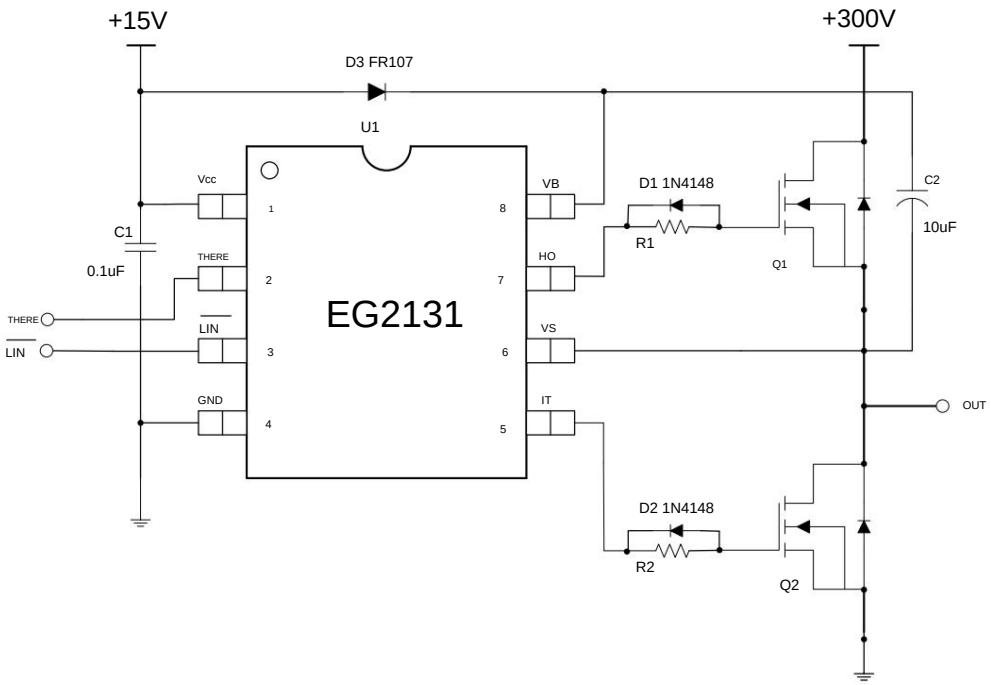


Figure 6-1. Typical application circuit diagram of EG2131

7. Electrical Characteristics

7.1 Limit parameters

Unless otherwise stated, under the condition of TA=25ÿ

Symbolic parameter name Bootstrap high-side VB power supply		Test Conditions Min Max Unit			
VB			-0.3	300	IN
VS	high-end suspension		VB-25	VB+0.3	IN
HO	high end output		VS-0.3	VB+0.3	IN
IT	low end output		-0.3	VCC+0.3	IN
VCC	power supply		-0.3	25	IN
HIN High channel logic signal input level			-0.3	VCC+0.3	IN
ÿÿÿÿÿ Low channel logic signal input level			-0.3	6	IN
PER	ambient temperature		-45	125	ÿ
Tstr	Storage temperature		-55	150	ÿ
TL	Soldering temperature	T=10S		300	ÿ

Note: Exceeding the listed limit parameters may cause permanent damage to the chip, and long-term operation under the limit conditions will affect the reliability of the chip.

7.2 Typical parameters

Unless otherwise stated, under the condition of TA=25ÿ, Vcc=15V, load capacitance CL=10nF

Parameter name	symbol	Test Conditions	Min	Typical	Max	Units
Power	Vcc		11	15	20	IN
Quiescent Current	Icc	input floating, Vcc=12V -			30	uA
Input logic signal high potential	Vin(H)	All input control signals	2.5			IN
Input logic signal low potential	Vin(L)	All input control signals	-0.3	0	1.0	IN
The current Iin(H) of the high level of the input logic signal		Vin=5V			20	uA
The current Iin(L) of the low level of the input logic signal		Vin=0V	-20			uA
VCC Power Supply Under-Voltage Shutdown Characteristics						
Vcc turn-on voltage	Vcc(on)		9.6	10.3	11	IN
Vcc shutdown voltage	Vccÿoffÿ		8.6	9.3	10	IN
Low-Side Output LO Switching Time Characteristics						
On delay	Ton	See Figure 7-1		410	500	nS
off delay	Toff	See Figure 7-1		150	300	nS
Rise Time	Tr	See Figure 7-1		180	300	nS
fall time	Tf	See Figure 7-1		70	150	nS
High-side output HO switching time characteristics						
On delay	Ton	See Figure 7-2		400	500	nS
off delay	Toff	See Figure 7-2		150	400	nS
Rise Time	Tr	See Figure 7-2		180	300	nS
fall time	Tf	See Figure 7-2		70	150	nS
Dead Time Characteristics						
dead time	DT	See Figure 7-3, No load capacitance CL=0	150	250	350	nS
IO output maximum drive capability						
IO output source current	IO+	Vo = 0V, VIN = VIH PWÿ10uS	0.7	1		A
IO output sink current	IO	Vo = 12V, VIN = VIL PWÿ10uS	1	1.5		A

7.3 Switching time characteristics and dead time waveform

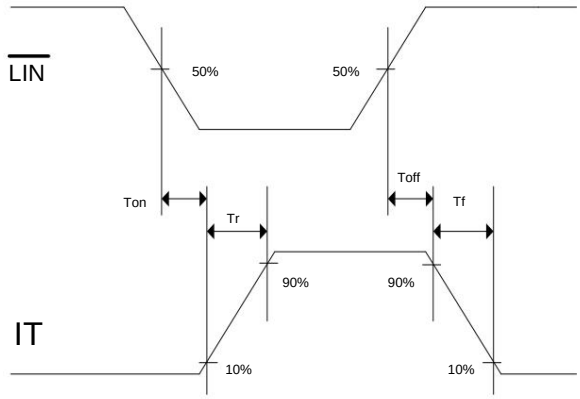
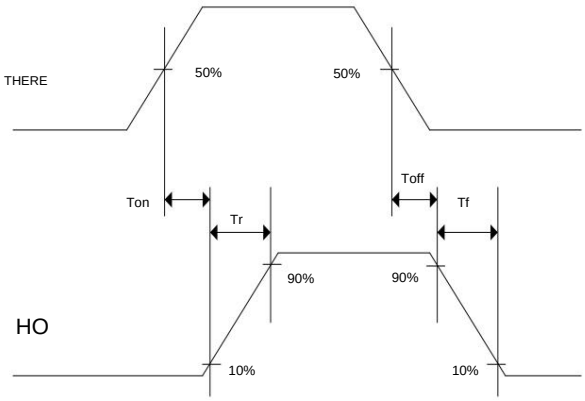


Figure 7-1. Low-Side Output LO Switching Time Waveform Diagram



7-2. High-side output HO switching time waveform

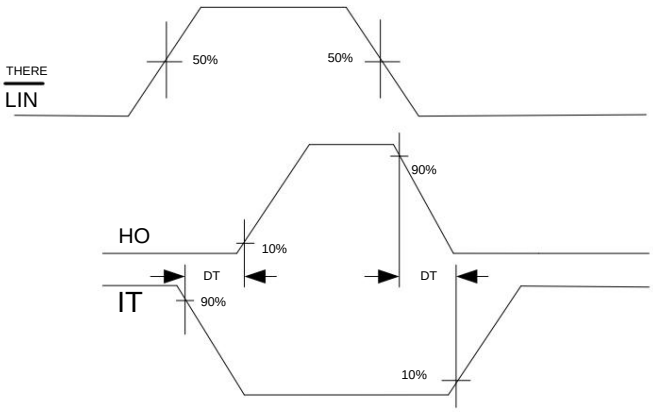


Figure 7-3. Dead Time Waveform

8. Application Design

8.1 Vcc terminal supply voltage

Considering that there is enough driving voltage to drive the N-channel power MOS transistor, the recommended power supply Vcc working voltage is typically 11V-20V; EG2131

The ground of the chip is the same as the ground of the MCU.

8.2 Input logic signal requirements and output driver characteristics

The main functions of EG2131 are logic signal input processing, dead time control, level conversion function, suspension bootstrap power supply structure and upper and lower bridges

Totem pole output. The high-level threshold of the logic signal input terminal is above 2.5V, and the low-level threshold is below 1.0V, which requires the output of the logic signal

The current is small, so that the MCU output logic signal can be directly connected to the input channel of EG2131.

High-side high-side and low-side low-side output drivers can sink up to 1.5A and output current up to 1A, high-side high-side channels

It can withstand a voltage of 300V, the conduction delay between the input logic signal and the output control signal is small, and the low-end output turn-on conduction delay is 410nS,

The turn-off conduction delay is 140nS, the high-side output turn-on conduction delay is 400nS, and the turn-off conduction delay is 150nS. The low-side output turns on when the rising

The turn-off time is 180nS, the turn-off fall time is 100nS, the high-side output turn-on rise time is 180nS, and the turn-off fall time is 100nS.

The logic function diagram of input signal and output signal is shown in Figure 8-1:

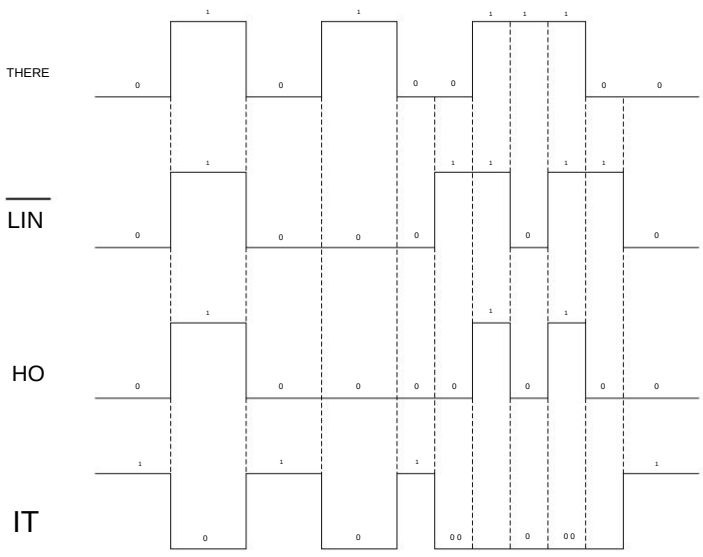


Figure 8-1. Input signal and output signal logic function diagram

Input signal and output signal logic truth table:

enter		output	
Input and output logic			
HIN (pin 4)	LINÿÿÿÿÿ (Pin 3) HO (Pin 7		LO (pin 5)
0	**0**	0	**1**
0	1	0	0
1	0	0	0
1	**1**	**1**	0

It can be seen from the truth table that when the input logic signals HIN and LINÿÿÿÿÿ are both "0" and not simultaneously "1", the driver controls the output HO and LO are “0” at the same time, the upper and lower power tubes are turned off at the same time; when the input logic signals HIN, LINÿÿÿÿÿ are “0” at the same time, the driver controls the output HO When the input logic signal HIN and LINÿÿÿÿÿ are both "1", the driver control output HO is "1" upper tube is turned on, LO is "0" and lower tube is turned off; the internal logic processor prevents the upper and lower power tubes of the controller output from being turned on at the same time, with mutual Latch function.

8.3 Bootstrap Circuit

EG2131 adopts the bootstrap suspension drive power structure, which greatly simplifies the drive power design. Only one power supply voltage VCC can be used to complete the high-end power supply. The driving of two power switching devices, N-channel MOS transistor and low-side N-channel MOS transistor, brings great convenience to practical applications. EG2131 can Use an external bootstrap diode as shown in Figure 8-2 and a bootstrap capacitor to automatically complete the bootstrap boost function, assuming that the lower tube is turned on and the upper tube is turned off The C bootstrap capacitor has been charged to a sufficient voltage (Vc=VCC). When the HO output is high, the upper tube is turned on and the lower tube is turned off. The voltage on the VC bootstrap capacitor is The voltage will be equivalent to a voltage source as the power supply of the internal drivers VB and VS to complete the driving of the high-side N-channel MOS transistor.

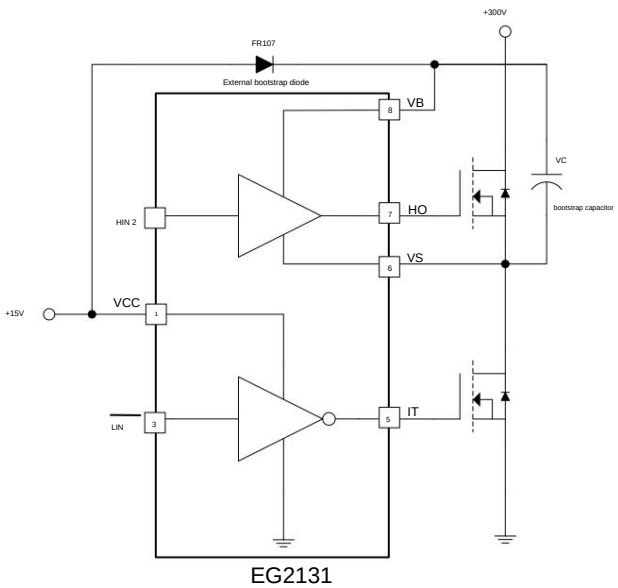


Figure 8-2. EG2131 Bootstrap Circuit Structure

9. Package size

9.1 SO8 Package Dimensions